

USNDP Dissemination

Tim Johnson
National Nuclear Data Center

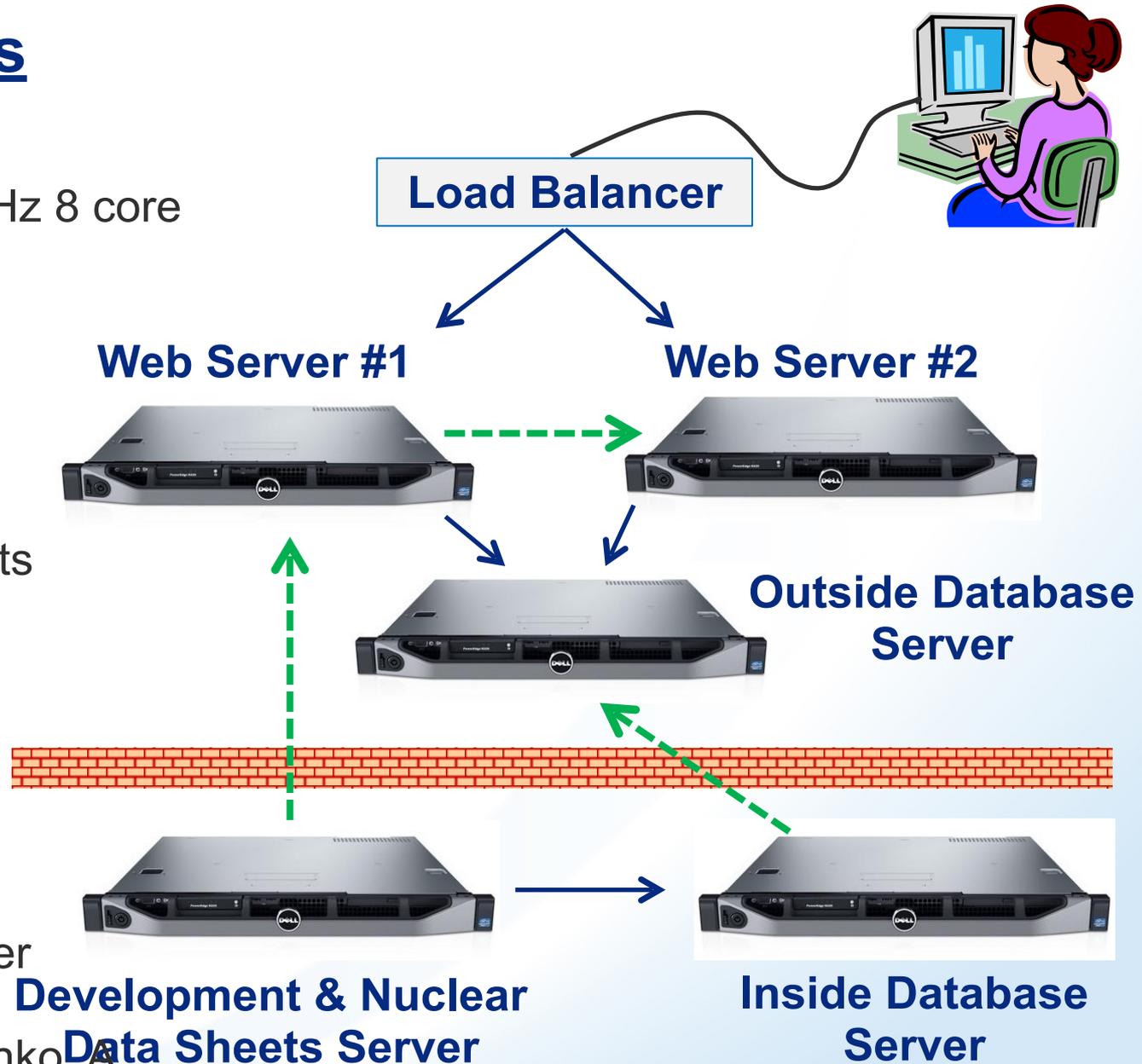


NNDL Servers

5 Dell Servers
Intel Xeon Dual 2.9 MHz 8 core
128 GB RAM
About \$20K each
Dissemination and
Archival.

- Made possible by:
- \$150K CE DoE grants in 2003, 2008, 2013
 - BNL's ITD support

Ramon Arcilla, admin.
Tim Johnson, webmaster
Programmers:
T. Johnson, B. Pritychenko, A.
Sonzogni, V. Zerkin



GForge site: collaborative environment for nuclear data development. ("Facebook" of nuclear data)

Features:

- File uploading/downloading
- Subversion (SVN) versioning system
- Management of releases
- Document management
- News announcements
- Issue (bug) tracking
- Mailing lists

Used by USNDP for development of:
codes, ENDF/B, new data structure,
manuals, Web services, ...
(61 projects, 150 users)



Infrastructure Changes

- Server move
 - Both web servers, database servers, and development server moved to different racks and subnet
- Upcoming server upgrades
 - 5 year old servers with increasing users is starting to result in decreasing performance
 - \$50,000 to replace 2 web servers, external mysql db server, and development.

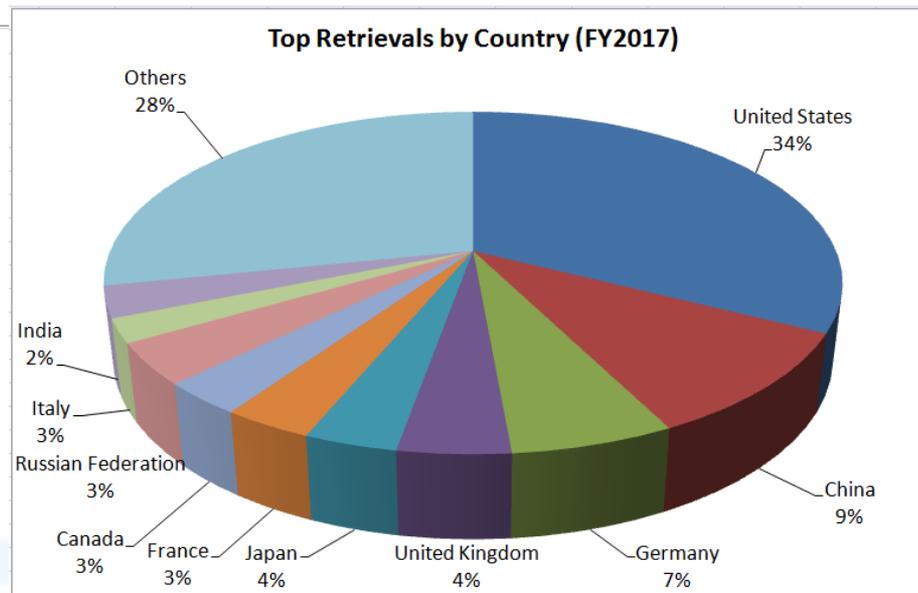
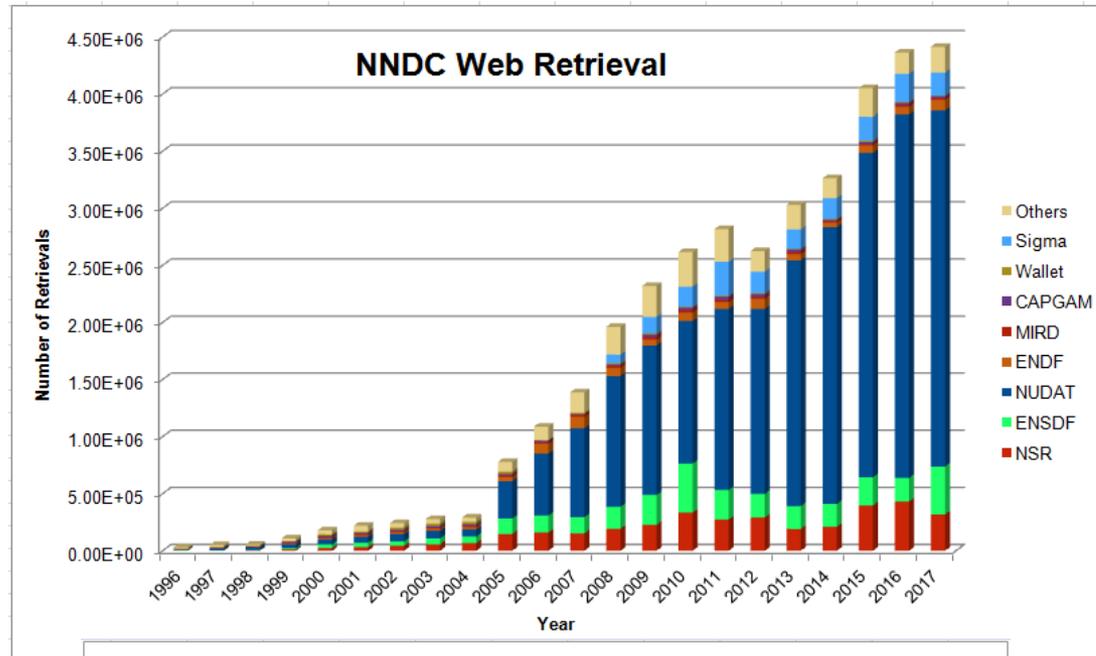


Infrastructure Changes

- Server upgrades (cont.)
 - All replacements: Dell PowerEdge R630 server. 800 GB solid state drive SATA. PERC H330 RAID controller. Intel Xeon processor, 2.4 GHz, 25M cache
 - Web: memory increase from 128 GB RAM to 192 GB
 - Database: memory increase 96 GB RAM to 128 GB
 - Development: stays at 64 GB

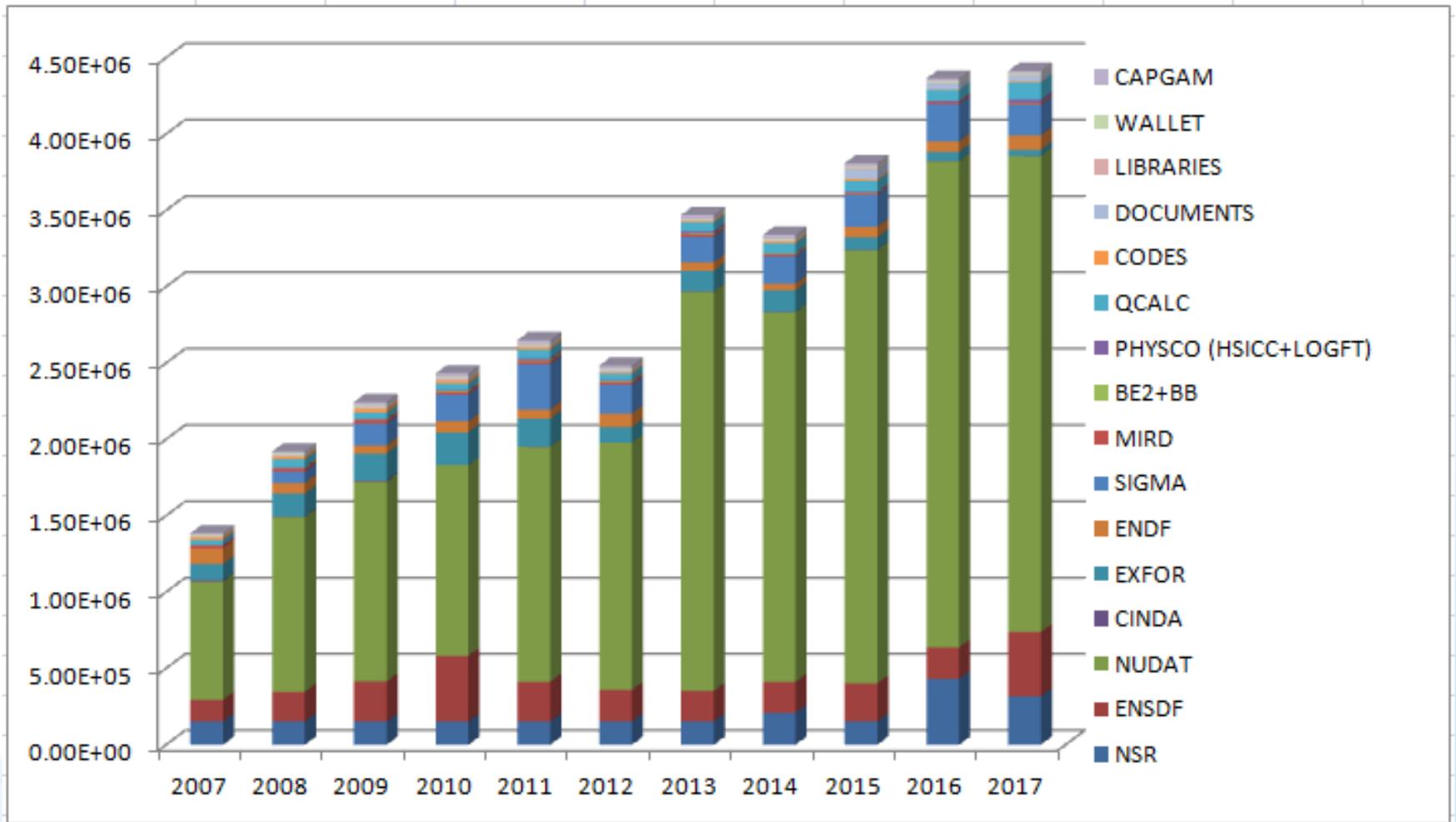


Web Retrieval Statistics



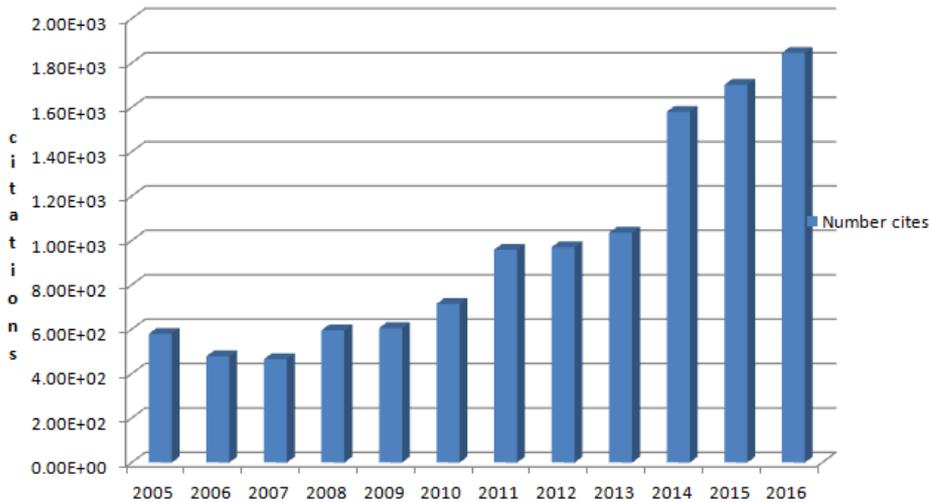
2017 USNDP - Tim Johnson

Web statistics (cont)



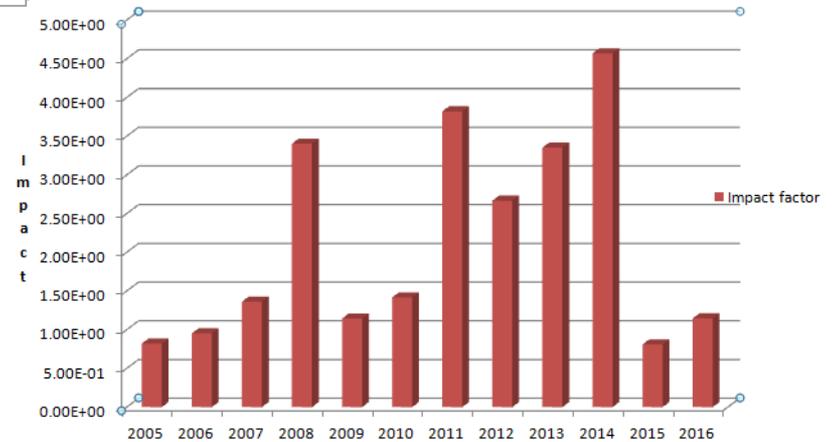
Nuclear Data Sheets

Number cites



Parameters from The Journal Citation Report.

Impact factor



In FY 2017, 15 articles published.

Cyber Security News



- Cyber Sec reports from 2010-2011 listed around 3000 vulnerabilities.
- Included cross scripting, cross framing, sql-injection, and others.
- 2017: For the first time, Cyber Sec found 0 web vulnerabilities.

Web Related Activities

- Ongoing updates and routine maintenance
- Changes to ENSDF
- Enhancements to NuDat
- Updates to Exfor

ENSDF Changes

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[NNDc Databases: NuDat](#) | [NSR](#) | [XUNDL](#) | **ENSDF** | [MIRD](#) | [ENDF](#) | [CSISRS](#) | [Sigma](#)

ENSDF: Evaluated Nuclear Structure Data File Search and Retrieval

Last updated 2017-09-29

ENSDF provides recommended nuclear structure and decay information.
For more recent nuclear data which has not yet been evaluated, please visit [XUNDL](#).

103 new datasets added/modified in the last month!

Suggestions or comments? Please [let us know!](#)

[Quick Search](#) | [By Nuclide](#) | [By Reaction](#) | [By Decay](#) | [Recently Added](#)

Nuclide or mass: [Search](#)

(208Pb, pb-208, 144, 1n (neutron), etc.)

You can also [browse](#) ENSDF datasets by element or mass, at a glance.

Resources

- [Evaluators' Corner](#)
- [Format Manual](#)
- [Procedures Manual](#)
- [Analysis and Utility Codes](#)
- [Q Values](#)
- [Logft](#)
- [Archived ENSDF Files](#)
- [Brfcc](#)
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Accessing Java-NDS pdf files

Datasets for ^{96}Mo

There are 14 corresponding XUNDL (unevaluated) sets

Check out our new 'PDF Version', which includes improvements to tables and drawings. We encourage users to [let us know](#) of any errors or formatting issues with these new features as well as suggestions on how to improve the presentation of the data evaluation further.

Matching datasets in ENSDF

Retrieve selected ENSDF datasets:

PDF Version ENSDF text format

Dataset	Last Revised	References
<input type="checkbox"/> Select All		
<input checked="" type="checkbox"/> ADOPTED LEVELS, GAMMAS	2008-10	All references
<input type="checkbox"/> 96NB B- DECAY	2008-10	All references
<input type="checkbox"/> 96TC EC DECAY (4.28 D)	2008-10	All references
<input type="checkbox"/> 96TC EC DECAY (51.5 D)	2008-10	All references

Adopted Levels, Gammas

Type	Author	History	Citation	Cutoff Date
Full Evaluation	D. Abriola(a), A. A. Sonzogni		NDS 109, 2501 (2008)	1-Apr-2008

$Q(\beta^-)=-2973.6$; $S(n)=9154.32$; $S(p)=9297.5$; $Q(\alpha)=-2758.9$ 19 2012Wa38

Note: Current evaluation has used the following Q record.

$Q(\beta^-)=-2973.5$; $S(n)=9154.32$; $S(p)=9297.6$; $Q(\alpha)=-2761.5$ 20 2003Au03

 ^{96}Mo LevelsCross Reference (XREF) Flags

A	^{96}Nb β^- decay	H	$^{95}\text{Mo}(n,\gamma)$ E=25 keV	O	$^{98}\text{Mo}(p,t)$, (pol p,t)
B	^{96}Tc ε decay (4.28 d)	I	$^{96}\text{Mo}(n,n'\gamma)$	P	$^{100}\text{Ru}(d,^6\text{Li})$
C	^{96}Tc ε decay (51.5 min)	J	$^{96}\text{Mo}(p,p')$	Q	$^{94}\text{Mo}(t,p)$
D	$^{94}\text{Zr}(\alpha,^3\text{He},n)$	K	$^{96}\text{Mo}(d,d')$	R	$^{82}\text{Se}(^{18}\text{O},4n\gamma)$
E	$^{94}\text{Zr}(\alpha,2n\gamma)$	L	$^{96}\text{Mo}(\alpha,\alpha')$	S	$^{96}\text{Mo}(\text{pol } \gamma,\gamma')$
F	$^{95}\text{Mo}(n,\gamma)$ E=thermal	M	Coulomb excitation		
G	$^{95}\text{Mo}(n,\gamma)$ E=2 keV	N	$^{97}\text{Mo}(p,d)$		

E(level) [#]	J ^{π}	T _{1/2}	XREF	Comments
0.0 [†]	0 ⁺	stable	ABCDEFGHIJKLMNOPS	$\langle r^2 \rangle^{1/2}(\text{charge})=4.3841$ 8 (2004An14).
778.237 [†] 10	2 ⁺	3.67 ps 6	ABC EFGHIJKLMNOPS	$\mu=+0.79$ 6 (2001Ma17) J ^{π} : γ to 0 ⁺ is E2. T _{1/2} : from B(E2)=0.270 4 (Coul. ex). Q=-0.20 8 or +0.04 8 (1976Pa13). μ measured using transient field method following Coulomb excitation.
1148.13 7	0 ⁺	61 ps 8	F IJK MN PQ	T _{1/2} : from B(E2)(2 ⁺ to 0 ⁺)=0.0270 35 (Coul. ex). J ^{π} : L=0 in (t,p).
1330? 50	0 ⁺		D	J ^{π} : L=0 in ($^3\text{He},n$).
1497.787 10	2 ⁺	0.78 ps 7	ABC EFGHIJKLMNOPS	J ^{π} : L(p,p')=2.

NuDat Plots and Systematics

NuDat 2.7

Search and plot nuclear structure and decay data interactively. [More...](#)

Levels and Gammas Search

Ground and excited states (energy, $T_{1/2}$, spin/parity, decay modes), gamma rays (energy, intensity, multipolarity, coinc.)

Nuclear Wallet Cards Search

Latest Ground and isomeric states properties

Decay Radiation Search

Radiation type, energy, intensity and dose following nuclear decay

Color code	Half-life	Decay Mode	Q_{β^-}	Q_{EC}	Q_{β^+}	S_n	S_p	Q_{α}	ΔQ_{α}	S_{2n}	S_{2p}	$Q_{2\beta^-}$	Q_{2EC}	Q_{ECp}	$Q_{\beta-n}$		
$Q_{\beta-2n}$	BE/A	(BE-LDM Fit)/A	Pair. gap	$E_{1st\ ex. st.}$	E_{2+}	E_{3-}	E_{4+}	E_{4+}/E_{2+}	β_2	$B(E2)_{42}/B(E2)_{20}$	$\sigma(n,\gamma)$	$\sigma(n,F)$	235U FY	239Pu FY	252Cf FY		
Z	93Ru	94Ru	95Ru	96Ru	97Ru	98Ru	99Ru	100Ru	101Ru	102Ru	103Ru	104Ru	105Ru	106Ru	107Ru	108Ru	109Ru
	92Tc	93Tc	94Tc	95Tc	96Tc	97Tc	98Tc	99Tc	100Tc	101Tc	102Tc	103Tc	104Tc	105Tc	106Tc	107Tc	108Tc
42	91Mo	92Mo	93Mo	94Mo	95Mo	96Mo	97Mo	98Mo	99Mo	100Mo	101Mo	102Mo	103Mo	104Mo	105Mo	106Mo	107Mo
	90Nb	91Nb	92Nb	93Nb	94Nb	95Nb	96Nb	97Nb	98Nb	99Nb	100Nb	101Nb	102Nb	103Nb	104Nb	105Nb	106Nb
40	89Zr	90Zr	91Zr	92Zr	93Zr	94Zr	95Zr	96Zr	97Zr	98Zr	99Zr	100Zr	101Zr	102Zr	103Zr	104Zr	105Zr
	88Y	89Y	90Y	91Y	92Y	93Y	94Y	95Y	96Y	97Y	98Y	99Y	100Y	101Y	102Y	103Y	104Y
38	87Sr	88Sr	89Sr	90Sr	91Sr	92Sr	93Sr	94Sr	95Sr	96Sr	97Sr	98Sr	99Sr	100Sr	101Sr	102Sr	103Sr
	86Rb	87Rb	88Rb	89Rb	90Rb	91Rb	92Rb	93Rb	94Rb	95Rb	96Rb	97Rb	98Rb	99Rb	100Rb	101Rb	102Rb
36	85Kr	86Kr	87Kr	88Kr	89Kr	90Kr	91Kr	92Kr	93Kr	94Kr	95Kr	96Kr	97Kr	98Kr	99Kr	100Kr	101Kr
	49	51	53	55	57	59	61	63	N								

Foottips: On Off

Zoom: 1 NDS, 2 Standard, 3 Screen Size, 4 Narrow, 5 Wide, 6, 7

Nucleus: go

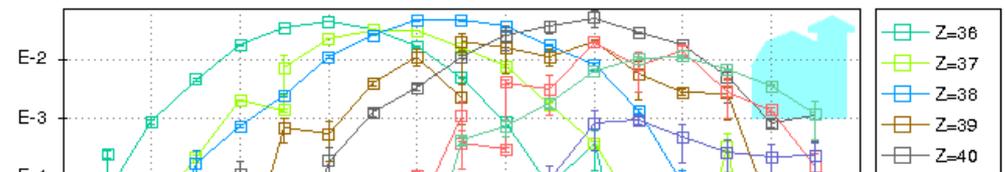
probability legend:

- $\geq 1.00E-1$ (dark red)
- $1.00E-2$ (red)
- $1.00E-3$ (orange)
- $1.00E-4$ (light orange)
- $1.00E-5$ (yellow)
- $1.00E-6$ (light yellow)
- $1.00E-7$ (pale yellow)
- $1.00E-8$ (pale green)
- $1.00E-9$ (light green)
- $1.00E-10$ (green)
- $1.00E-11$ (medium green)
- $1.00E-12$ (dark green)
- $\leq 1.00E-13$ (black)
- unknown (grey)

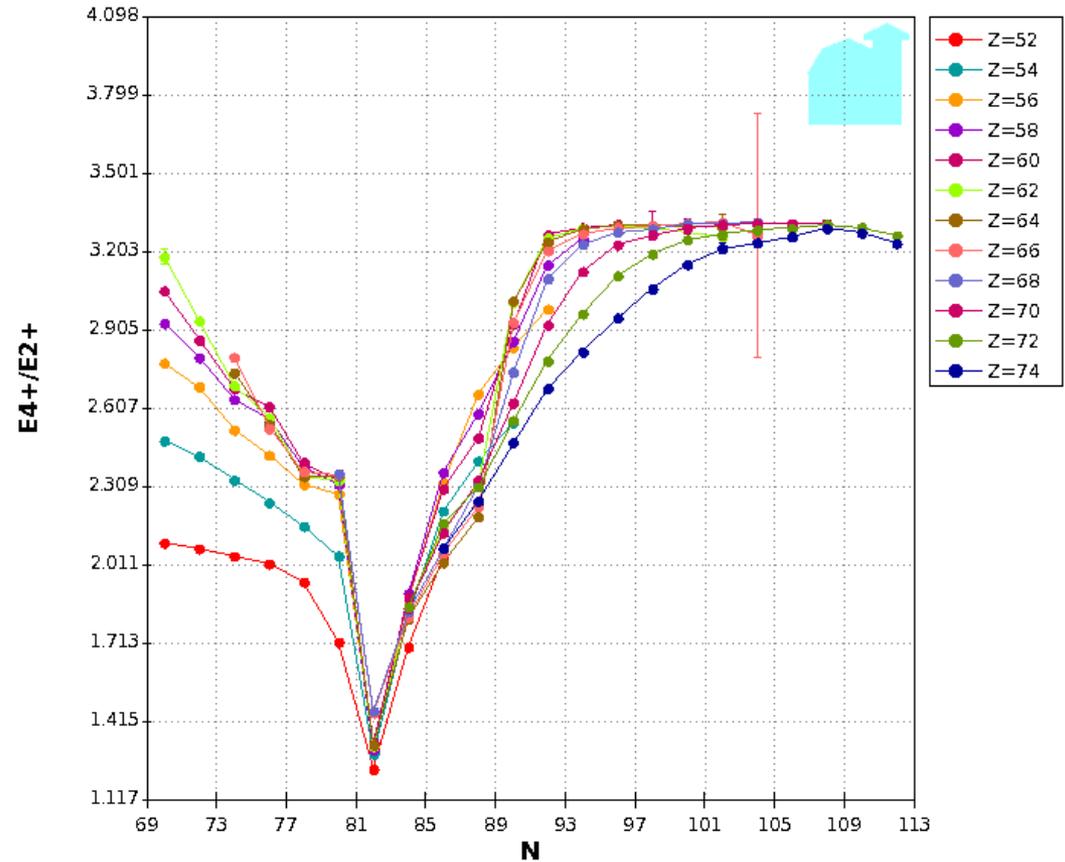
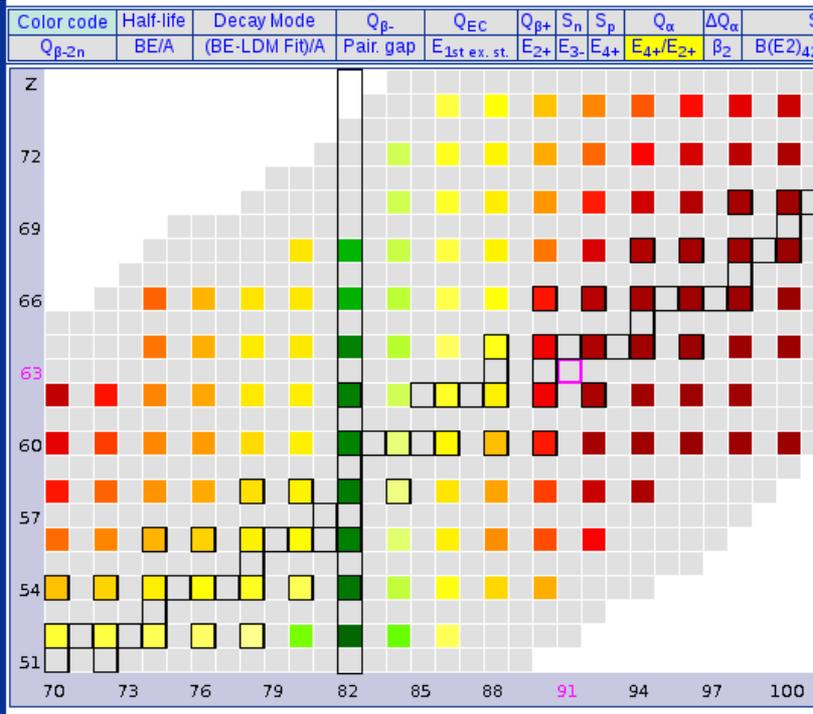
Ground and isomeric state information for $^{97}_{40}\text{Zr}$

E(level) (MeV)	J π	Δ (MeV)	$T_{1/2}$	Decay Modes	235U FY
0.0	1/2+	-82.9426	16.749 h 8	β^- : 100.00 %	0.0109 7

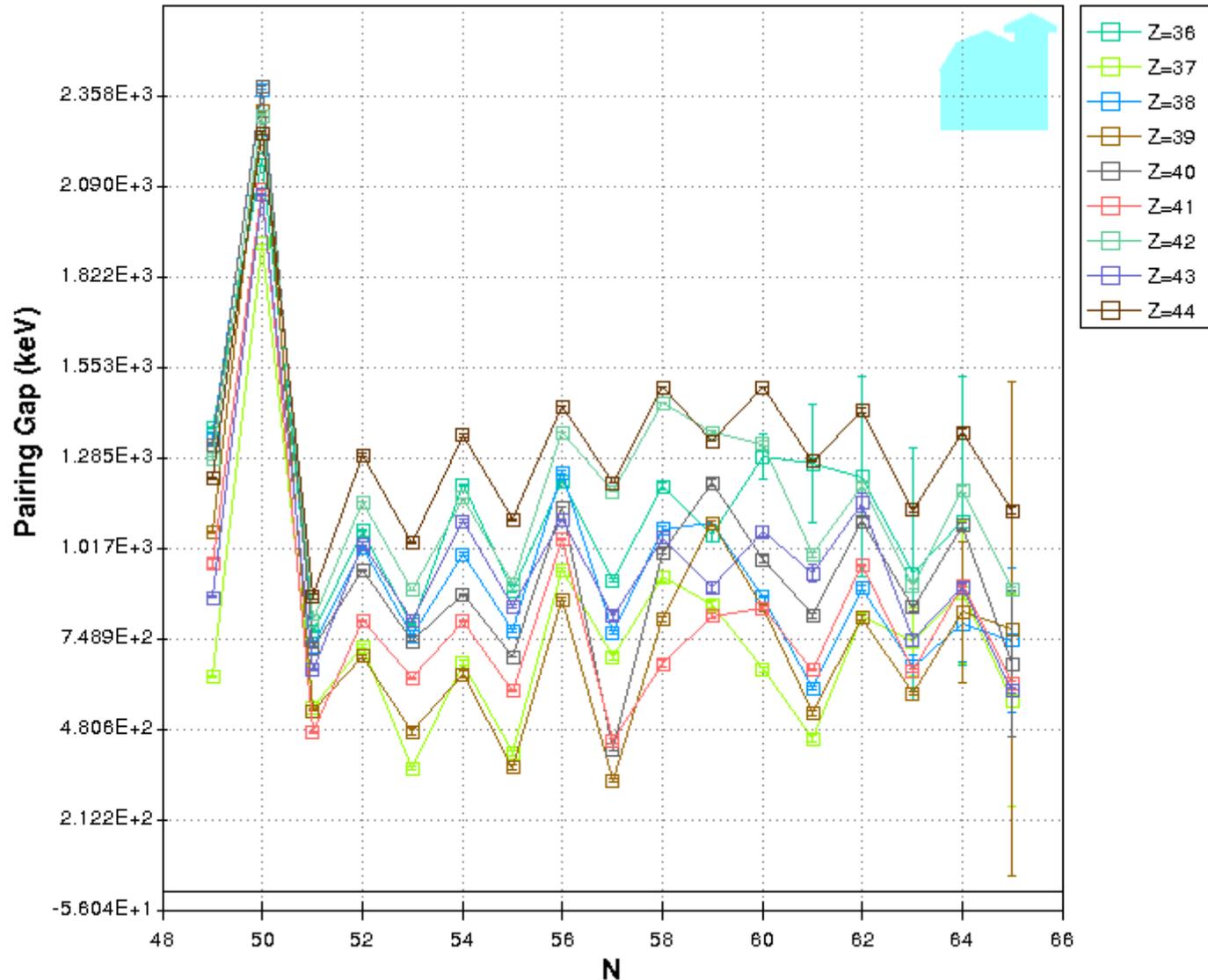
A list of levels, a level scheme, a J vs E* plot and decay radiation information are available. The corresponding projections on the N and Z axis are found below. The data can be found [here](#).



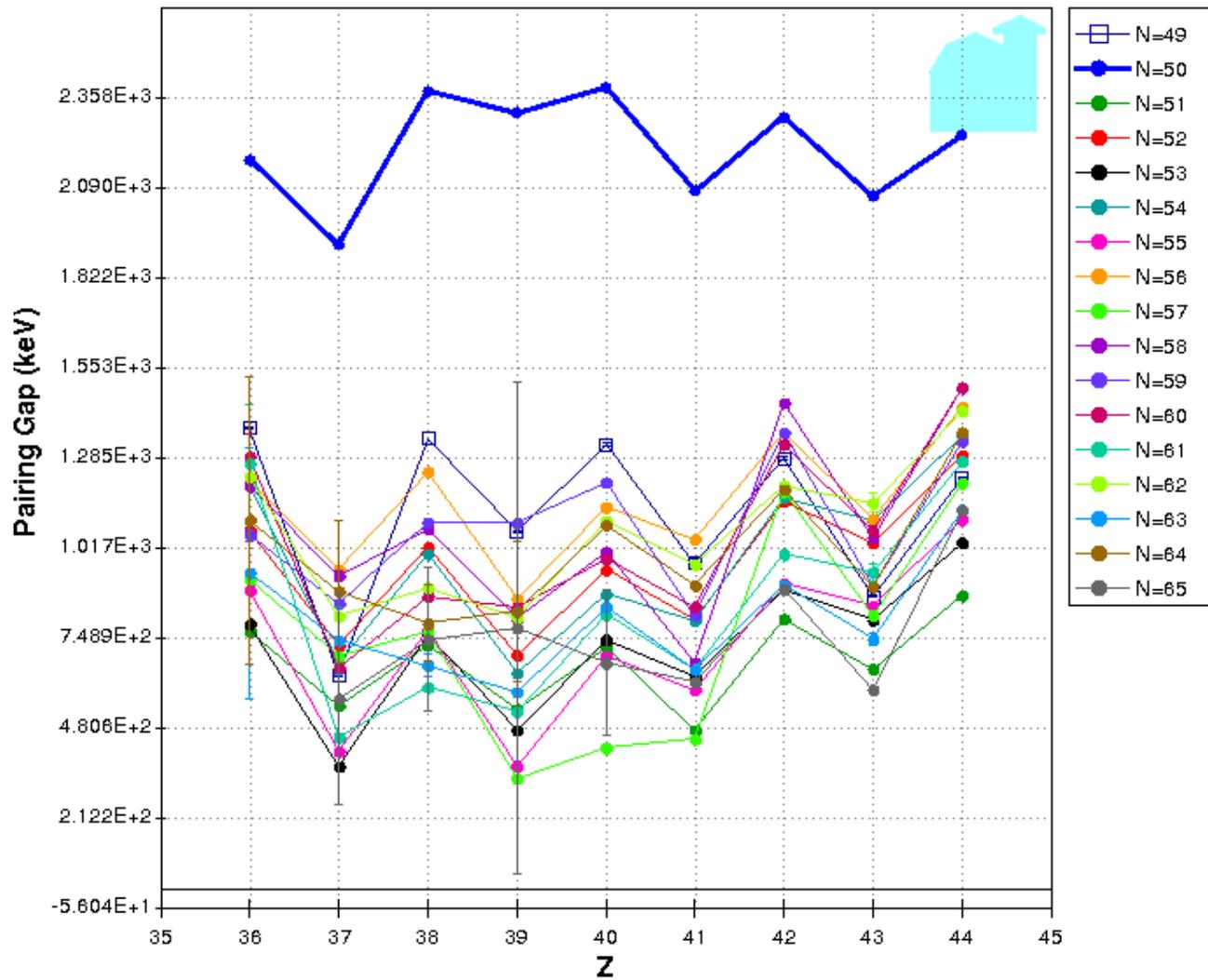
E4/E2 Ratios from NuDat



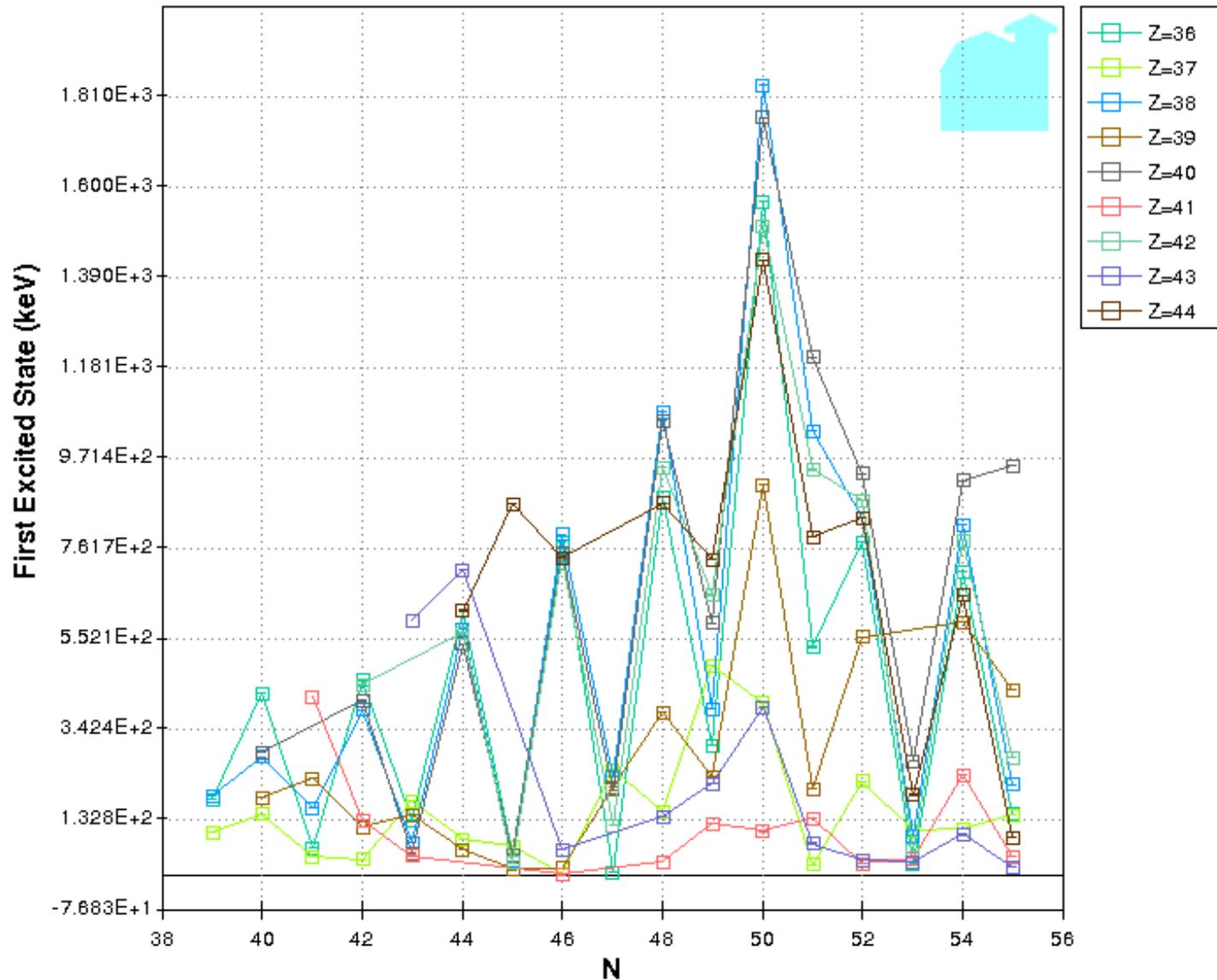
Pairing Gap (plotted vs. N)



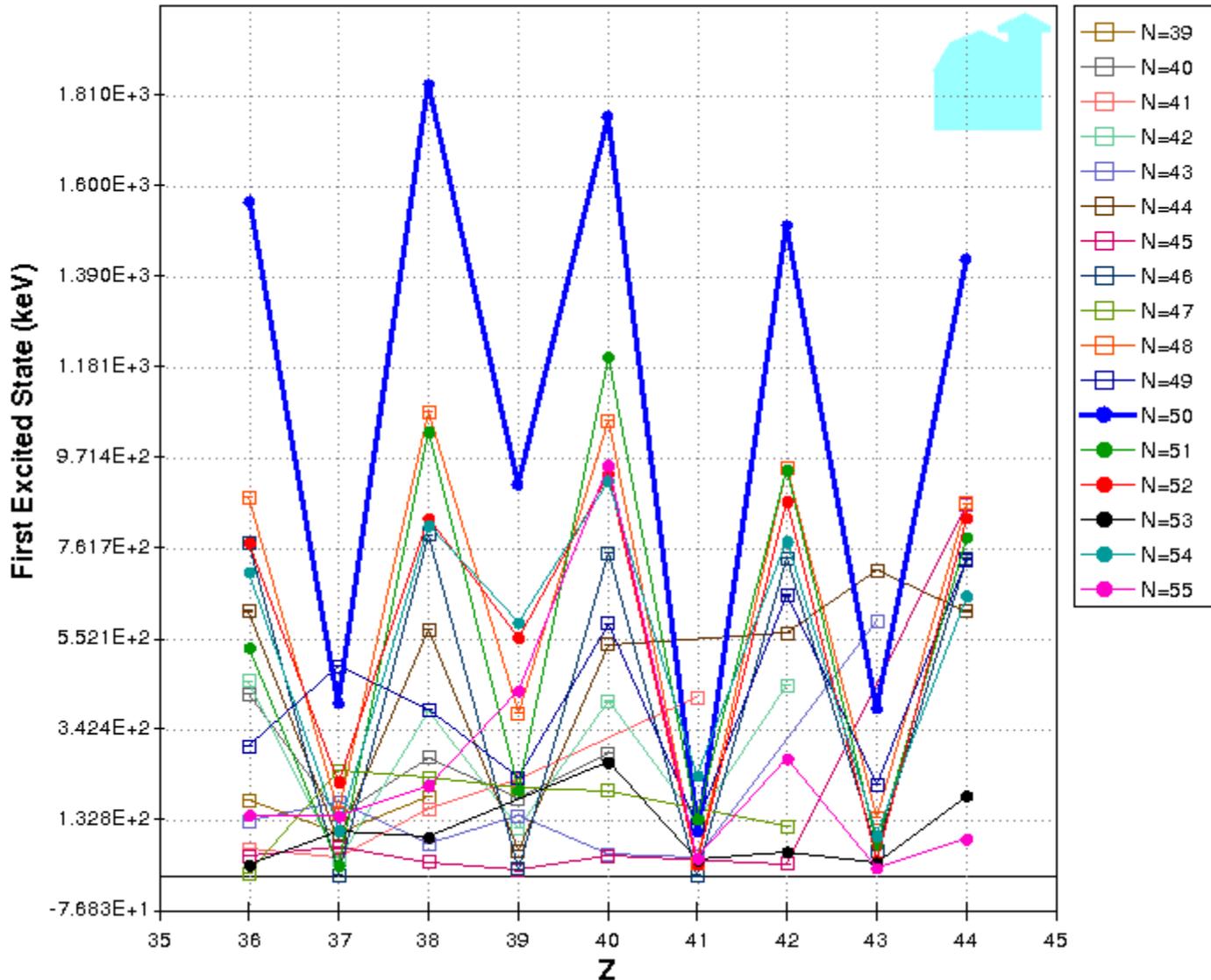
Pairing Gap (plotted vs. Z)



First Excited States (plotted vs. N)



First Excited States (plotted vs. Z)



Exfor updated

Help » EXFOR-Manual | NNDC-Help | CSISRS/EXFOR History | Submit » Your Data | Databases » ENDF | CINDA | NSR

  **Experimental Nuclear Reaction Data (EXFOR)**
Database Version of 2017-10-20 

The EXFOR library contains an extensive compilation of experimental nuclear reaction data. Neutron reactions have been compiled systematically since the discovery of the neutron, while charged particle and photon reactions have been covered less extensively. The library contains data from **21869** experiments (see [statistics](#) and [recent updates](#)).
EXFOR Reference Paper: Nucl. Data Sheets 120(2014)272 | EXFOR Mirror-sites 

Search: 

Examples of requests: [Cross section \$\sigma\(E\)\$](#) / [updates/](#) [More examples...](#)

Go to: [\[upload your data\]](#)

Options Plotting. See also: [\[video-guide\]](#)

Ranges (Z,A)

Reaction Sub-Fields

Feedback and User's Input

- Comments/questions?
- Previously submitted comments
- Enter your own experimental data

Request

Target 

Reaction 

Quantity 

Product 

Energy from to eV 

Author(s) 

Publication year 

Last modified 

Accession # 

Clone Request:

Extended
 Keywords
 Expert

Note:
- all criteria are optional (selected by checking)
- selected criteria are combined for search with logical AND
- criteria separated in a field by ";" are combined with logical OR
- criteria starting with "^" will be used as logical NOT
- wildcards (*) and intervals (..) are available

Statistics of usage: visits: 31171, data search: 50793, since 16-Sep-2014

Database Manager: Boris Pritychenko, NNDC, Brookhaven National Laboratory (pritychenko@bnl.gov)
Web and Database Programming: Viktor Zerkin, NDS, International Atomic Energy Agency (V.Zerkin@iaea.org) 2017-10-12
Data Source: Network of Nuclear Reaction Data Centres

Summary (to be continued)

- Server move completed and upgrades on the way
- Web vulnerabilities cut to 0. Code in place to minimize future effort
- Enhancements to major applications completed
- Number of web visits continues to increase, along with citations to Nuclear Data Sheets

